2013 Lower Pecos

FIELD SAMPLING PLAN

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Prepared by

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APPROVAL PAGE

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TABLE OF CONTENTS

APPROVAL PAGE i
TABLE OF CONTENTS ii
ACRONYMS iii
INTRODUCTION 1
1.0 PROJECT PERSONNEL 2
1.1 Personnel Roles and Responsibilities 2
1.2 Organization 3
2.0 PROJECT DESCRIPTION 3
2.1 Background 3
2.2 Objectives 4
2.3 Schedule 4
2.4 Location 5
3.0 DOCUMENTATION 9
4.0 SAMPLING PLAN 9
4.1 Chemistry Sampling 9
4.2 Biology/Habitat Sampling 13
5.0 RESOURCE REQUIREMENTS 16
6.0 REFERENCES 19

ACRONYMS

AU	Assessment Unit
BPJ	Best Professional Judgment
CWA	Clean Water Act
DM	Dissolved Metals
DO	Dissolved Oxygen
IR	State of New Mexico Clean Water Act §303(d)/305(b) Integrated Report
MASS	Monitoring, Assessment, and Standards Section
MPG	Miles per gallon
NMED	New Mexico Environment Department
NPDES	National Pollutant Discharge Elimination System
NPS	Non-point Source
PSRS	Point Source Regulation Section
QA	Quality Assurance
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan
RAD	Radionuclide
SBD	Stream Bottom Deposits
SLD	Scientific Laboratory Division
SC	Specific Conductance
SOP	Standard Operating Procedure
SVOC	Semi-Volatile Organic Carbon
SWQB	Surface Water Quality Bureau
TDS	Total Dissolved Solids
TKN	Total Kjeldahl Nitrogen
TM	Total Metals
TMDL	Total Maximum Daily Load
TRC	Total Recoverable Chlorine
TSS	Total Suspended Solids
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
VOC	Volatile Organic Carbon
WPS	Watershed Protection Section
WQ	Water Quality
WQCC	Water Quality Control Commission
WQS	Water Quality Standards
WTU	Work Time Unit
WWTP	Wastewater Treatment Plant

INTRODUCTION

The purpose of this field sampling plan is to provide a detailed description of the Lower Pecos Water Quality Survey to be conducted in the Pecos River watershed from Sumner Dam to the Texas border during 2013 by the New Mexico Environment Department (NMED) Surface Water Quality Bureau (SWQB). It has been prepared in accordance with SOP 2.1, Field Sampling Plans. It describes project objectives and decision criteria, and includes the sampling plan with sampling locations, parameters, and sampling frequencies for physical, chemical, and biological data. It may be amended as the need arises. Amendments will be documented and justified in the survey report.

This plan is a companion document to the Surface Water Quality Bureau Quality Assurance Project Plan (QAPP) for Water Quality Management Programs (NMED/SWQB 2012a). Data will be collected according to the QAPP and the most recent version of the Standard Operating Procedures (SOPs) for Water Quality Data Collection (NMED/SWQB 2007 or most recent if available).

The survey includes the main stem of the Pecos River from Sumner Dam to the Texas state line, and most perennial tributaries that enter the Pecos River in that reach. The area of the surveyed watershed is 46,959.25 km^2, of which 1,3048.80 km^2 (27.8%) is in Chaves County, 1,3048.80 km^2 (0.33%) is in Curry County, 5,874.11 km^2 (12.51%) is in De Baca County, 10,503.21 km^2 (22.37%) is in Eddy County, 1,743.17 km^2 (3.71%) is in Guadalupe County, 5,585.80 km^2 (11.89%) is in Lea County; 6,330.73 km^2 (13.48%) is in Lincoln County; 1,007.87 km^2 (2.14%) is in Otero County; 1,050.95 km^2 (2.24%) is in Quay County; 1,009.99 km^2 (2.15%) is in Roosevelt County; and 647.31 km^2 (1.38%) is in Torrance County. Historic and current land uses in the lower Pecos River watershed include agriculture (range, pasture, and croplands), barren land, commercial, forest, grassland, residential, shrubland, water, and wetlands. Land ownership in the watershed includes the Bureau of Land Management (BLM), U.S. Forest Service, Bureau of Reclamation (BOR), U. S. Fish and Wildlife Service (USFWS), National Park Service, New Mexico State Parks, New Mexico Department of Game and Fish, Department of Defense (DOD), and state, tribal, and private parcels.

1.0 PROJECT PERSONNEL

1.1 Personnel Roles and Responsibilities

Table 1 details the responsibilities for this project. Each team member is responsible for implementing the assigned responsibilities. If individuals are unable to fulfill their duties, it is the individual's responsibility to find assistance and/or a replacement, in coordination with appropriate supervisors.

Table 1
Personnel Roles and Responsibilities

Team Member	Position/Role	Responsibilities
Gary Schiffmiller gary.schiffmiller@state.nm.us (505) 827-2470 Scott Murray scott.murray@state.nm.us (505) 827-2621	Project Coordinator(s)	• Coordinates survey planning efforts (integrates the documentation of various team members' information into the field sampling plan and planning spreadsheet); • Coordinates and participates in the collection of chemical, biological, and habitat data including sonde and thermograph data collection efforts; • Manages data for study (forms, data entry, data verification and analysis); • Prepares final survey report integrating information from all team members.
Charles Dentino charles.dentino1@state.nm.us (505) 827-0101	Lakes Coordinator	• Project coordinator duties pertaining to lakes.
Kristine Pintado kristine.pintado@state.nm.us (505) 827-2822	Standards Liaison	• Provides information and data needs pertaining to water quality standards development and refinement located within the study area.
Barbara Cooney barbara.cooney@state.nm.us (505) 827-0212	Point Source Regulation Section (PSRS) Liaison	• Provides information and data needs pertaining to point source discharges located within the study area; • Assists with development of final survey report, as needed.
Chris Canavan chris.canavan@state.nm.us (575) 647-7926	Watershed Protection Section (WPS) Liaison	• Provides information and data needs pertaining to nonpoint sources of pollution and BMPs located within the study area. • Assists with development of final survey report, as needed.
Heidi Henderson heidi.henderson@state.nm.us (505) 827-2901	TMDL Liaison	• Provides information and data needs pertaining to TMDL development to be conducted in the study area; • Assists with development of final survey report, as needed; and • Develops TMDLs as needed.

1.2 Organization

For the responsibilities defined in this project, the Project Coordinators, Standards liaison and Total Maximum Daily Load (TMDL) liaison report to the MASS Program Manager. The Point Source Regulation Section (PSRS) liaison reports to the PSRS Program Manager. The Watershed Protection Section (WPS) Liaison reports to the WPS Program Manager. Program Managers report to the SWQB Chief.

2.0 PROJECT DESCRIPTION

2.1 Background

The impairments listed in Table 2 were identified during SWQB's 2003 survey of the Lower Pecos watershed (NMED/SWQB 2006; NMED/SWQB 2009) and other investigations. IR Category refers to the New Mexico's Integrated Report categories (See Appendix A).

Table 2
Use Attainment Status

Assessment Unit	Water Quality Segment	Impairments	IR Category	Completed TMDLs
Pecos River (Salt Creek to Sumner Reservoir)	20.6.4.207	Dissolved oxygen	5C	None
Pecos River (Rio Felix to Salt Creek)	20.6.4.206	DDT in fish tissue; PCBs in fish tissue	5C	None
Pecos River (Brantley Reservoir to Rio Felix)	20.6.4.206	DDT in fish tissue; PCBs in fish tissue	5C	None
Pecos River (Avalon Reservoir to Brantley Reservoir)	20.6.4.204	DDT in fish tissue	5C	None
Pecos River (Black River to Lower Tansil Lake)	20.6.6.202	PCBs in fish tissue	5C	None
Pecos River (Texas border to Black River)	20.6.4.201	Boron, Dissolved Oxygen, PCBs in fish tissue	5C	None
Rio Hondo (Pecos River to North Spring River)	20.6.4.206	Not Assessed	3	None
North Spring River (Rio Hondo to headwaters)	20.6.4.206	Not Assessed	3	None
Black River (Pecos River to Blue River)	20.6.4.202	Partially Assessed	2	None
Black River (Blue River to headwaters)	20.6.4.202	Partially Assessed	2	None
Blue Spring (Black River to headwaters)	20.6.4.202	Partially Assessed	2	None

Assessment Unit	Water Quality Segment	Impairments	IR Category	Completed TMDLs
Delaware River (Pecos River to Texas border)	20.6.4.202	Partially Assessed	2	None
Sitting Bull Creek (Last Chance Canyon to Sitting Bull Spring)	20.6.4.99	None	1	None

2.2 Objectives

The project objectives that have been identified to meet the various needs within the SWQB appear in Table 3. Data needs have been determined based on impairments from the previous studies, identified data gaps, and consultation with SWQB MASS, PSRS, and WPS staff as well as other state agencies, federal agencies, tribes, local watershed groups, and interested parties.

Table 3
Project Objectives

	Collect Water Quality Data to:	Question to be answered	Products/ Outcomes	Decision Criteria
Primary Objective	Assess designated use attainment for the *Integrated Report* and provide information to the public on the condition of surface water	Are sampled waterbodies meeting WQS criteria?	Survey Report; Integrated Report	WQS as interpreted by the Assessment Protocols
Secondary Objectives	Develop load and waste load allocations for TMDLs	What is the maximum pollutant load a waterbody can receive and meet the requirements of the WQS?	TMDL loading calculations and NPDES permit limits	WQS as interpreted by the Assessment Protocols
	Evaluate restoration and mitigation measures implemented to control NPS pollution	Have watershed restoration activities and mitigation measures improved water quality?	Project Summary Reports, NPS Annual Report, *Integrated Report (De-Listing)*	WQS as interpreted by the Assessment Protocols
	Develop or refine surface water quality standards (WQS)	Are the existing uses appropriate for the waterbody?	Use Attainability Analyses (UAA); Amendments to WQS	Are data sufficient to support a petition to the WQCC to revise WQS?

2.3 Schedule

As part of the survey planning process public meetings are held to receive public input on any areas of concern within the assessment units surveyed and to inform interested parties about the general water quality survey, assessment and TMDL processes as well as our specific sampling plans in the watershed this year. For this survey, one public meeting was held on 24 January, 2013 at 6 pm in Roswell, NM**.** Inputs were incorporated into this document

Water chemistry results typically take several months to return from the analytical laboratory, Scientific Laboratory Division (SLD). When these data are received, they are verified and validated as described in NMED/SWQB 2010a. Once all data have been received and validated and verified, the data will be assessed according to the most recent version of the assessment protocols in time for incorporation into the 2016-2018 Integrated Report (IR). Once the assessments are complete, the TMDL development process will begin for any identified impairments. TMDLs are tentatively scheduled for completion in fall 2016.

The progress of this project will be documented and tracked from its inception through implementation to ensure all sampling and analytical activities are performed in accordance with all applicable requirements and in a cost effective manner. Table 4 provides the project timeline.

Table 4
Project Schedule

Activity	Winter 2012-2013	Spring 2013	Summer 2013	Fall 2013	Winter 2013-2014	Spring 2014	Summer 2014	Fall 2014	Winter 2014
Survey Planning, Site Reconnaissance, and Public Input Period	==========▶								
Data Collection & Submittal of WQ Samples to SLD		==========▶							
Data Verification & Validation Procedures, Assessment of data		==========▶							
Publication of Survey Report								==========▶	

2.4 Location

The project area includes the Pecos River from Sumner Dam to the Texas border (Tables 5a-5b and Figure 1). Sampling will also occur on several springs and tributaries to the Pecos River in New Mexico, including Blue Spring, Rattlesnake Spring, Rio Hondo, North Spring River, Black River, Delaware River, and Sitting Bull Creek. Several lakes and reservoirs will also be included (see Lakes section).

Table 5a SWQB Water Quality stations in the 2013 Lower Pecos Watershed Survey (streams)

Map #	Station ID	Station Name	Station Rationale
1	52PecosR485.0	Pecos River at Sumner Dam	Most upstream point in survey
2	52PecosR447.8	Pecos River above Fort Sumner WWTP	Bracket point source
3	NM0023477	Fort Sumner WWTP effluent	Point source monitoring
4	52PecosR447.7	Pecos River blw Fort Sumner WWTP	Bracket point source
5	52PecosR343.0	Pecos River below Six Mile Draw	Bottom of AU
6	52PecosR305.0	Pecos River at Bitter Lake NWR, North Unit	Bottom of AU; minimally impacted
7	56PecosR273.0	Pecos River at US 380, Tatum Bridge	Bracket major tributary (Rio Hondo)
8	57NSprin003.4	North Spring River @ RR trestle	Bracket potential point source
9	57NSprin002.0	North Spring River at Loveless Park	Bracket potential point source
10	57RHondo011.5	Rio Hondo above Roswell WWTP effluent	Bracket point source (when discharging to river)
11	NM0020311	Roswell WWTP effluent	Point source monitoring
12	57RHondo010.6	Rio Hondo blw Roswell WWTP	Bracket point source (when discharging to river)
13	57RHondo004.3	Rio Hondo at US 380 Bridge	Bracket USFWS restoration project
14	57RHondo000.5	Rio Hondo abv Pecos River	Bracket USFWS restoration project; Bottom of AU
15	56PecosR262.6	Pecos River below Rio Hondo	Bracket major tributary (Rio Hondo)
16	56PecosR239.9	Pecos River @ Wichita Rd. near Dexter	Bottom of AU
17	56PecosR194.6	Pecos River near Lake Arthur	Temperature data logger
18	56PecosR176.2	Pecos River above Artesia WWTP effluent	Bracket point source (when discharging to river)
19	NM0022268Pipe	Artesia WWTP effluent at Pecos River	Point source monitoring
20	56PecosR169.0	Pecos River at US 82 bridge near Artesia	Bracket point source (when discharging to river)
21	56PecosR160.2	Pecos River above Rio Penasco	Habitat data collection (representative of typical habitat)
22	60PecosR134.3	Pecos River abv Brantley Reservoir near Lakewood	Bottom of AU; Brantley inflow
23	60PecosR123.1	Pecos River below Brantley Dam	Only station in AU; lake outflow
24	60PecosR093.2	Pecos River below Lower Tansil Dam	Bracket point source; lake outflow

Map #	Station ID	Station Name	Station Rationale
25	NM0026395-M	Carlsbad WWTP	Point source monitoring
26	60PecosR088.1	Pecos River below Carlsbad WWTP near Otis	Bracket point source
27	60PecosR067.0	Pecos River below Ten Mile Dam	Bracket potential influence of potash mining
28	60PecosR060.1	Pecos River above Black River	Bottom of AU; bracket major tributary
29	60RatSpr001.4	Rattlesnake Spring	Drinking water source for Carlsbad Caverns National Park
30	60BlackR055.4	Black River at headwater springs	Most upstream station on major tributary
31	60BlackR027.6	Black River abv Blue River	Bottom of AU
32	60BlueSp002.0	Blue Spring	Only station in AU; occupied habitat of several listed species
33	60BlackR002.8	Black River blw RR Xing	Bottom of AU
34	60PecosR055.9	Pecos River below Black River (Harroun Crossing)	Bracket major tributary; bracket Malaga Bend salt springs
35	60PecosR033.2	Pecos River at Pierce Canyon Crossing	Bracket Malaga Bend salt springs
36	60 PecosR011.6	Pecos River near Red Bluff	Bottom of AU
37	62Delawa006.0	Delaware River at US 285	Bottom of AU
38	60Sittin000.1	Sitting Bull Creek below recreation area	Bottom of AU

Table 5b SWQB Water Quality stations in the 2013 Lower Pecos Watershed Survey (Lakes)

Map #	Station ID	Station Name	Station Rationale
1	56LakeVanDeep	Lake Van	High recreational use
2	60BrantleyDam	Brantley	High recreational use, DDT impairment
3	60LCarlsbadDp	Lake Carlsbad	High recreational use, PCBs impairment
4	60SixMileDamL	Six Mile Lake	High recreational use
5	56LeaLakeDeep	Lea Lake deep 1/3 lakelength from vis. center.	High recreational use
6	56LeaLakeOver	Lea Lake overflow abv NM409	Lea Lake overflow
7	56FigEightLkD	Figure 8 Lake	Standards

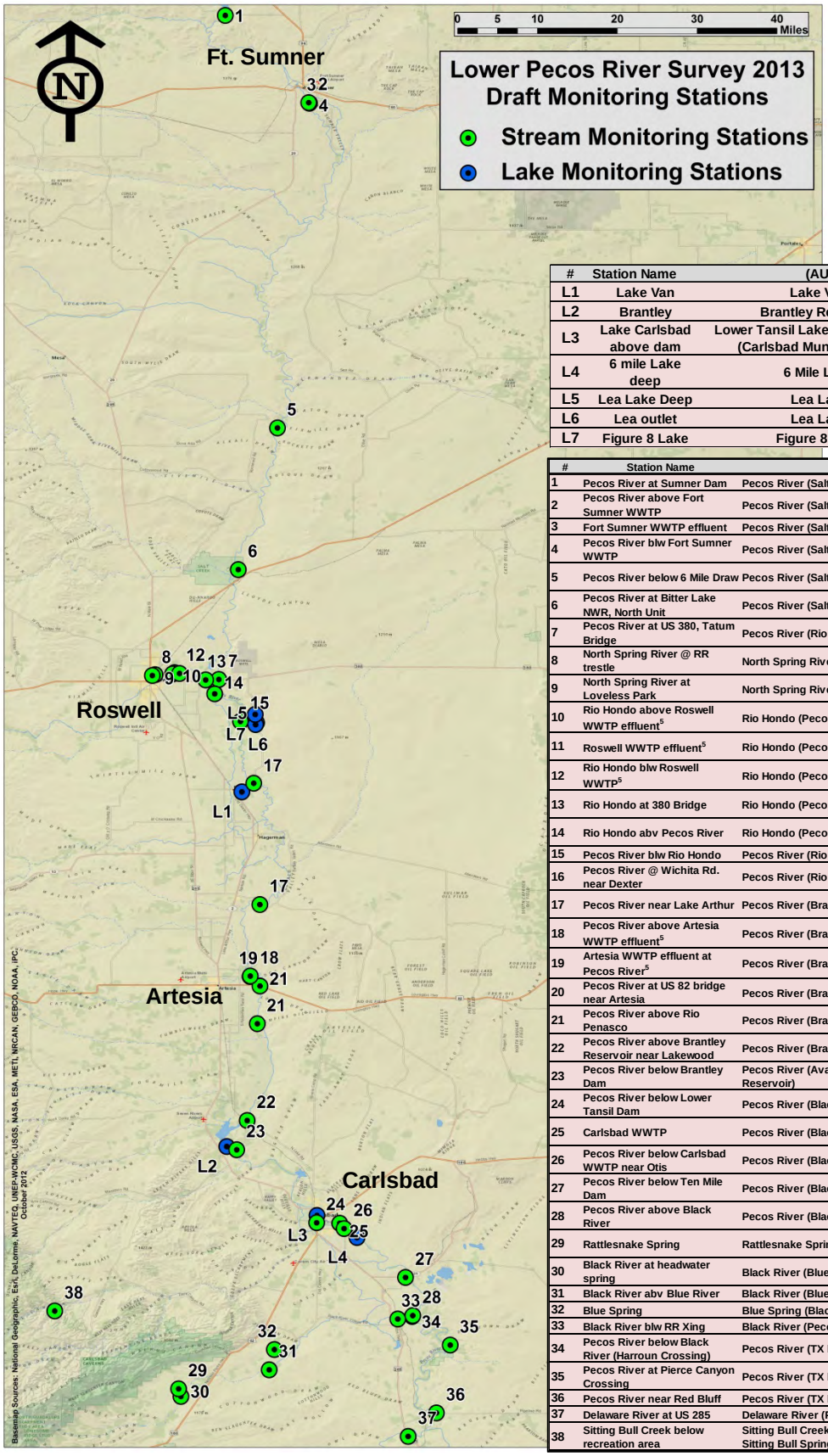

Figure 1. Project area and sampling locations.

#	Station Name	(AU)
L1	Lake Van	Lake Van
L2	Brantley	Brantley Reservoir
L3	Lake Carlsbad above dam	Lower Tansil Lake/Lake Carlsbad (Carlsbad Municipal Lake)
L4	6 mile Lake deep	6 Mile Lake
L5	Lea Lake Deep	Lea Lake
L6	Lea outlet	Lea Lake
L7	Figure 8 Lake	Figure 8 Lake

#	Station Name	(AU)
1	Pecos River at Sumner Dam	Pecos River (Salt Creek to Sumner Dam)
2	Pecos River above Fort Sumner WWTP	Pecos River (Salt Creek to Sumner Dam)
3	Fort Sumner WWTP effluent	Pecos River (Salt Creek to Sumner Dam)
4	Pecos River blw Fort Sumner WWTP	Pecos River (Salt Creek to Sumner Dam)
5	Pecos River below 6 Mile Draw	Pecos River (Salt Creek to Sumner Dam)
6	Pecos River at Bitter Lake NWR, North Unit	Pecos River (Salt Creek to Sumner Dam)
7	Pecos River at US 380, Tatum Bridge	Pecos River (Rio Felix to Salt Creek)
8	North Spring River @ RR trestle	North Spring River (Rio Hondo to headwaters)
9	North Spring River at Loveless Park	North Spring River (Rio Hondo to headwaters)
10	Rio Hondo above Roswell WWTP effluent[5]	Rio Hondo (Pecos River to North Spring River)
11	Roswell WWTP effluent[5]	Rio Hondo (Pecos River to North Spring River)
12	Rio Hondo blw Roswell WWTP[5]	Rio Hondo (Pecos River to North Spring River)
13	Rio Hondo at 380 Bridge	Rio Hondo (Pecos River to North Spring River)
14	Rio Hondo abv Pecos River	Rio Hondo (Pecos River to North Spring River)
15	Pecos River blw Rio Hondo	Pecos River (Rio Felix to Salt Creek)
16	Pecos River @ Wichita Rd. near Dexter	Pecos River (Rio Felix to Salt Creek)
17	Pecos River near Lake Arthur	Pecos River (Brantley headwaters to Rio Felix)
18	Pecos River above Artesia WWTP effluent[5]	Pecos River (Brantley headwaters to Rio Felix)
19	Artesia WWTP effluent at Pecos River[5]	Pecos River (Brantley headwaters to Rio Felix)
20	Pecos River at US 82 bridge near Artesia	Pecos River (Brantley headwaters to Rio Felix)
21	Pecos River above Rio Penasco	Pecos River (Brantley headwaters to Rio Felix)
22	Pecos River above Brantley Reservoir near Lakewood	Pecos River (Brantley headwaters to Rio Felix)
23	Pecos River below Brantley Dam	Pecos River (Avalon Reservoir to Brantley Reservoir)
24	Pecos River below Lower Tansil Dam	Pecos River (Black River to Lower Tansil Dam)
25	Carlsbad WWTP	Pecos River (Black River to Lower Tansil Dam)
26	Pecos River below Carlsbad WWTP near Otis	Pecos River (Black River to Lower Tansil Dam)
27	Pecos River below Ten Mile Dam	Pecos River (Black River to Lower Tansil Dam)
28	Pecos River above Black River	Pecos River (Black River to Lower Tansil Dam)
29	Rattlesnake Spring	Rattlesnake Spring (Black River to headwaters)
30	Black River at headwater spring	Black River (Blue Spring to headwaters)
31	Black River abv Blue River	Black River (Blue Spring to headwaters)
32	Blue Spring	Blue Spring (Black River to headwaters)
33	Black River blw RR Xing	Black River (Pecos River to Blue Spring)
34	Pecos River below Black River (Harroun Crossing)	Pecos River (TX border to Black River)
35	Pecos River at Pierce Canyon Crossing	Pecos River (TX border to Black River)
36	Pecos River near Red Bluff	Pecos River (TX border to Black River)
37	Delaware River at US 285	Delaware River (Pecos River to TX border)
38	Sitting Bull Creek below recreation area	Sitting Bull Creek (Last Chance Canyon to Sitting Bull Spring)

3.0 DOCUMENTATION

Project documents include this field sampling plan, probable source sheets, calibration records, field sheets (including sonde and thermograph deployment/retrieval sheets), electronic data logger downloads, data validation and verification records, sample collection data, lab submittal forms, records of analytical data in hard copy or in electronic form. Documents will be maintained in accordance with the requirements of the Bureau QAPP (NMED/SWQB 2013).

Project documentation will include narrative descriptions of progress throughout the life of the project relating to planning and implementation efforts, including deviations from the original plan and issues that arise along with any associated corrective actions.

Project activities will be documented in SWQB Monitoring Section Field Sheets. Information from field sheets is entered in the SWQB database or maintained in the Project Coordinator's files which are placed in the survey files at the conclusion of the project. Analytical results are electronically transferred into the Bureau's database and eventually moved to STORET WQX. The project is completed with the completion of the Survey Report.

4.0 SAMPLING PLAN

4.1 Chemistry Sampling

Water quality samples will be submitted to the New Mexico Scientific Laboratory Division (SLD) or processed in the SWQB laboratory in accordance with procedures as outlined in the SWQB Standard Operating Procedures for Data Collection (SOPs) (NMED/SWQB 2007 or more recent if available).

Table 6 outlines water quality variables to be measured and the sampling frequency. In addition to the variables listed, field parameters (temperature, specific conductance, salinity, dissolved oxygen concentration, dissolved oxygen saturation, pH, and turbidity) will be measured at each site using a YSI® or Hydrolab® sonde.

Chemistry sampling site locations are chosen based on existing or potential point or non-point sources of pollution. Existing and potential sources of pollution are indentified from point source permits, historical data, information from other agencies, and local residents. Sampling stations were selected at locations that bracket perceived pollution sources, allow access to the waterbody, and represent each of the assessment units in the watershed except for very small or mostly ephemeral systems. Where possible, the use of established stations allows for the examination of trends.

Table 6a Water Chemistry Sampling Summary (Streams)

Map ID	Station Name	Assessment Unit (AU)	TSS only	TDS/TSS	Chloride and Sulfate	Nutrients [1]	Total Metals (Hg, Se, Al)	Dissolved Metals [2]	E. coli	VOC [3]	SVOC [3]	Radionuclides [4]	Cyanide	Total Residual Chlorine
1	Pecos River at Sumner Dam	Pecos River (Salt Creek to Sumner Dam)		8	8	8	4	4	8					

Map ID	Station Name	Assessment Unit (AU)	TSS only	TDS/TSS	Chloride and Sulfate	Nutrients [1]	Total Metals (Hg, Se, Al)	Dissolved Metals [2]	E. coli	VOC [3]	SVOC [3]	Radionuclides [4]	Cyanide	Total Residual Chlorine
2	Pecos River above Fort Sumner WWTP	Pecos River (Salt Creek to Sumner Dam)	8			8			8					
3	Fort Sumner WWTP effluent	Pecos River (Salt Creek to Sumner Dam)	8			8			8					8
4	Pecos River blw Fort Sumner WWTP	Pecos River (Salt Creek to Sumner Dam)	8			8			8					
5	Pecos River below 6 Mile Draw	Pecos River (Salt Creek to Sumner Dam)		8	8	8	4	4	8					
6	Pecos River at Bitter Lake NWR, North Unit	Pecos River (Salt Creek to Sumner Dam)		8	8	8	4	4	8					
7	Pecos River at US 380, Tatum Bridge	Pecos River (Rio Felix to Salt Creek)		8	8	8			8					
8	North Spring River @ RR trestle	North Spring River (Rio Hondo to headwaters)	8			8			8					
9	North Spring River at Loveless Park	North Spring River (Rio Hondo to headwaters)	8			8			8					
10	Rio Hondo above Roswell WWTP effluent	Rio Hondo (Pecos River to North Spring River)		2		2	2	2	2					
11	Roswell WWTP effluent	Rio Hondo (Pecos River to North Spring River)		2		2	2	2	2					2
12	Rio Hondo blw Roswell WWTP	Rio Hondo (Pecos River to North Spring River)		2		2	2	2	2					
13	Rio Hondo at 380 Bridge	Rio Hondo (Pecos River to North Spring River)		4		4	4	4	4					
14	Rio Hondo abv Pecos River	Rio Hondo (Pecos River to North Spring River)		8	8	8	4	4	8	2	2	2		
15	Pecos River blw Rio Hondo	Pecos River (Rio Felix to Salt Creek)		8	8	8			8					
16	Pecos River @ Wichita Rd. near Dexter	Pecos River (Rio Felix to Salt Creek)		8	8	8	4	4	8					
17	Pecos River near Lake Arthur	Pecos River (Brantley headwaters to Rio Felix)					Thermograph Only Station							

Map ID	Station Name	Assessment Unit (AU)	TSS only	TDS/TSS	Chloride and Sulfate	Nutrients [1]	Total Metals (Hg, Se, Al)	Dissolved Metals [2]	E. coli	VOC [3]	SVOC [3]	Radionuclides [4]	Cyanide	Total Residual Chlorine
18	Pecos River above Artesia WWTP effluent	Pecos River (Brantley headwaters to Rio Felix)		2		2	2	2	2					
19	Artesia WWTP effluent at Pecos River	Pecos River (Brantley headwaters to Rio Felix)		2		2	2	2	2	2	2	2	2	2
20	Pecos River at US 82 bridge near Artesia	Pecos River (Brantley headwaters to Rio Felix)		2		2	2	2	2					
21	Pecos River above Rio Penasco	Pecos River (Brantley headwaters to Rio Felix)					Habitat Only Station							
22	Pecos River above Brantley Reservoir near Lakewood	Pecos River (Brantley headwaters to Rio Felix)		8	8	8	4	4	8					
23	Pecos River below Brantley Dam	Pecos River (Avalon Reservoir to Brantley Reservoir)	8			8	4	4	8					
24	Pecos River below Lower Tansil Dam	Pecos River (Black River to Lower Tansil Dam)		8	8	8	4	4	8					
25	Carlsbad WWTP	Pecos River (Black River to Lower Tansil Dam)		8		8	4	4	8					2
26	Pecos River below Carlsbad WWTP near Otis	Pecos River (Black River to Lower Tansil Dam)		8	8	8	4	4	8					
27	Pecos River below Ten Mile Dam	Pecos River (Black River to Lower Tansil Dam)		4	4	4		4	4					
28	Pecos River above Black River	Pecos River (Black River to Lower Tansil Dam)		8	8	8	4	4	8					
29	Rattlesnake Spring	Rattlesnake Spring (Black River to headwaters)	4			4			4	2	2			
30	Black River at headwater spring	Black River (Blue Spring to headwaters)		8	8	8	4	4	8	4	4			
31	Black River abv Blue River	Black River (Blue Spring to headwaters)		8	8	8	4	4	8	4	4			
32	Blue Spring	Blue Spring (Black River to headwaters)	4			4			4	2	2			
33	Black River blw RR Xing	Black River (Pecos River to Blue Spring)		8	8	8	4	4	8	4	4	2		

Map ID	Station Name	Assessment Unit (AU)	TSS only	TDS/TSS	Chloride and Sulfate	Nutrients [1]	Total Metals (Hg, Se, Al)	Dissolved Metals [2]	E. coli	VOC [3]	SVOC [3]	Radionuclides [4]	Cyanide	Total Residual Chlorine
34	Pecos River below Black River (Harroun Crossing)	Pecos River (TX border to Black River)		8	8	8		4	8					
35	Pecos River at Pierce Canyon Crossing	Pecos River (TX border to Black River)		8	8	8		4	8			2		
36	Pecos River near Red Bluff	Pecos River (TX border to Black River)				8		4	8	4	4			
37	Delaware River at US 285	Delaware River (Pecos River to TX border)		8	8	8	4	4	8	4	4	2		
38	Sitting Bull Creek below recreation area	Sitting Bull Creek (Last Chance Canyon to Sitting Bull Spring)	4			4			4					
QC	*Number of field, equipment, reagent and bacterial blanks collected per QAPP.*		-	-	-	*8*	-	*8*	*8*	*8*	-	-		-
		TOTALS	**60**	**164**	**140**	**240**	**76**	**100**	**240**	**36**	**28**	**10**		**14**

Table 6b Water chemistry sampling summary. (Lakes)

Map ID	Station Name	Assessment Unit (AU)	TSS only	Nutrients [1]	Total Metals (Hg, Se, Al)	Dissolved Metals [2]	E. coli	VOC [3]	SVOC [3]	Radionuclides [4]
1	Lake Van – deep	Lake Van	4	4	4	4	4	2	2	2
2	Brantley Reservoir – deep	Brantley Reservoir	4	4	4	4	4	2	2	2
3	Lake Carlsbad above dam	Lower Tansil Lake/ Lake Carlsbad	4	4	4	4	4	2	2	2

Map ID	Station Name	Assessment Unit (AU)	TSS only	Nutrients [1]	Total Metals (Hg, Se, Al)	Dissolved Metals [2]	E. coli	VOC [3]	SVOC [3]	Radionuclides [4]
4	6 Mile Lake – deep	6 Mile Lake	4	4	4	4	4	2	2	2
5	Lea Lake – deep	Lea Lake	4	4	4	4	4	2	2	2
6	Lea Lake – outlet	Lea Lake	4	4			4	2	2	2
7	Figure 8 Lake – deep	Figure 8 Lake	4	4	4	4	4	2	2	2
QC	*Number of field, equipment, reagent and bacterial blanks collected per QAPP.*		*-*	*4*	*-*	*4*	*4*	*2*	*-*	*-*
		TOTALS	**28**	**32**	**24**	**28**	**32**	**16**	**14**	**14**

[1] Suite includes total Kjeldahl nitrogen, nitrate+nitrite, ammonia and total phosphorus.
[2] Suite includes aluminum, antimony, arsenic, barium, boron, cadmium, chromium, cobalt, copper, iron, manganese, molybdenum, nickel, silicon, silver, tin, vanadium and zinc PLUS calcium and magnesium
[3] See Appendix B for a complete list of analytes.
[4] A radionuclide sample will include gross alpha and gross beta and depending on detections may include Uranium mass and Radium 226 + 228.

4.2 Biology/Habitat Sampling

Measuring biological response indicators concurrent to physical habitat and chemistry gives an overall interpretation of the biological integrity of the reach represented, provides more complete information on characteristics of sediment and nutrients currently cycling through the stream and may provide enough information to investigate or eliminate specific potential sources of water quality stress. SWQB is currently collecting fish, periphyton, macroinvertebrates and physical habitat data at select sites to assess waterbodies for potential impairment from increased temperatures, sediment deposition, nutrient enrichment, and toxic pollutants. Sampling methods are conducted in accordance with the SOPs, which can be found on the SWQB website (http://www.nmenv.state.nm.us/swqb/SOP/). Biological sampling is conducted within a biological index period, August 15 through November 15, for appropriate comparability of samples and life history requirements. For this survey, SWQB will not collect fish data as USFWS monitors this area frequently and will provide their data. Sondes/Data Loggers are deployed at select sites in the stream for 3-10 days to record field variables in at least one hour intervals to document dissolved oxygen and pH fluctuations. Thermographs (data logging thermometers) are deployed from May through September at select sites throughout the survey to measure temperature fluctuations. All stations within this survey are located in xeric or foothills site classes and will be compared to an individual reference site.

Resources such as staff and budgets and other issues such as property ownership do not allow for the collection of biological and habitat data at all stations. Stations are selected for biological and habitat

monitoring based on 1) current Integrated List status, 2) results of the Level I Nutrient Assessment, 3) observational results of the surrounding land use including upland and riparian habitat conditions, including results of the Site Condition Class Verification & Probable Source Field Sheet and the Rapid Habitat Assessment. Additional sites determined, or considered, to be in "reference" or "best available condition" will also be selected for biological and habitat monitoring for inclusion in development and refinement of biological and habitat criteria. Table 7 summarizes the biological and habitat sampling that is planned for this survey.

Table 7a Biological and Habitat Sampling (Streams)

#	Station Name	Assessment Unit (AU)	Macro-invertebrates	Nutrient Level 1	Nutrient Level 2	Physical Habitat	Thermograph[1]	Sonde
5	Pecos River below 6 Mile Draw	Pecos River (Salt Creek to Sumner Dam)	x	x	x	x	x	x
6	Pecos River at Bitter Lake NWR, North Unit	Pecos River (Salt Creek to Sumner Dam)	x	x	x	x	x	x
13	Rio Hondo abv Pecos River	Rio Hondo (Pecos River to North Spring River)		x	x	x	x	x
15	Pecos River @ Wichita Rd. near Dexter	Pecos River (Rio Felix to Salt Creek)	x	x	x	x	x	x
20	Pecos River above Rio Penasco	Pecos River (Brantley headwaters to Rio Felix)	x	x	x	x	x	x
22	Pecos River below Brantley Dam	Pecos River (Avalon Reservoir to Brantley Reservoir)	x	x	x	x	x	x
27	Pecos River above Black River	Pecos River (Black River to Lower Tansil Dam)[2]	x	x	x	x		x
29	Black River at headwater springs	Black River (Blue Spring to headwaters)	x	x	x	x	x	x
33	Black River blw RR Xing	Black River (Pecos River to Blue Spring)	x	x	x	x	x	x
35	Pecos River near Red Bluff	Pecos River (TX border to Black River)[2]	x	x	x	x		x
36	Delaware River at US 285	Delaware River (Pecos River to TX border)	x	x	x	x	x	x
37	Sitting Bull Creek below recreation area	Sitting Bull Creek (Last Chance Canyon to Sitting Bull Spring)	x	x	x	x	x	x
---	*QC*	*Replicate collected per QAPP.*	*1*	-	-	*1*	-	-
	Totals		**12**	**12**	**12**	**13**	**10**	**12**

1. If preliminary analysis of thermograph data indicates potential for impairment, cross-section, flow, canopy cover, and slope data required to use SSTEMP temperature modeling software will be collected.
2. Temperature data from these assessment units will be provided by USGS gauges

Table 7b **Biological and Habitat Sampling Summary (Lakes)**

#	Station Name	Assessment Unit (AU)	Chlorophyll *a*	Phytoplankton
1	Lake Van	Lake Van	4	4
2	Brantley	Brantley Reservoir	4	4
3	Lake Carlsbad abv Dam	Lower Tansil Lake/Lake Carlsbad (Carlsbad Municipal Lake	4	4
4	6 Mile Lake deep	6 Mile Lake	4	4
5	Lea Lake Deep	Lea Lake	4	4
7	Figure 8 Lake	Figure 8 Lake	4	4
---	*QC*	*Replicate collected per QAPP.*	-	*1*
	Totals		**24**	**25**

5.0 RESOURCE REQUIREMENTS

Sample analysis costs include WTUs (work-time units) for chemical analysis performed at SLD and provided to SWQB through a Joint Powers Agreement between these State agencies as well as analysis costs for biological samples sent to contract labs and *E. coli* analysis performed by SWQB. These costs are summarized in Table 8.

A round trip for this survey is approximately 900 miles. Summer gasoline costs have been estimated at $3.50 per gallon. A 2002 Chevrolet Suburban is typically used for surveys, averaging approximately 17 miles per gallon (mpg). Eight water quality sampling trips have been planned for this survey depending on conditions, and two bio/physical survey trips are required during the index period (Aug 15-Nov 15). These are expected to be completed in three days with water chemistry samples being delivered to SLD in Albuquerque on the return trip (Table 9).

Water quality sampling trips will require two staff per monthly survey to stay up to two nights out of Santa Fe. Biological survey crew maximum requirements are four staff surveying one to two sites per day. Therefore, twelve biological survey sites may take up to ten days, or over two weeks (Table 10).

Staff receives $85 per night per diem for travel costs. Costs not included below may involve general sampling supplies such as water quality sample containers and preservatives, sonde calibration solutions, and periphyton, macroinvertebrate, fish, and habitat sampling/monitoring equipment. Vehicles will require standard preventative maintenance and unforeseen costs may arise at any time (Table 11).

Table 8a Biological and Chemical Cost Summary (Streams)

Analyte	Total # Samples	Cost per Sample (WTU or $)	Total Expenditure (WTU or $)
TSS only	60	12	720
TDS/TSS	164	24	3936
Chloride, Sulfate & Bromide	140	24	3360
Nutrients	240	76	18240
Nutrients, low phosphorus	0	100	0
Total Metals	76	90	6840
Dissolved Metals + Ca, Mg	100	210	21000
E. coli (in-house)	240	$5.08	$1,219
Volatile Organic Compunds	36	150	5400
Semi-volatile Organics	28	180	5040
Radionuclides	8	120	960
Cyanide, total	2	40	80
Chlorophyll *a* (in-house)	12	$45	$537
Periphyton*	12	$425	$5,100
Phytoplankton	0	$165	$0
Macroinvertebrates	12	$175	$2,100
TOTALS		**WTU**	**65,576**
		DOLLAR $	**$8,956**

Table 8b **Biological and Chemical Cost Summary (Lakes)**

Analyte	Total # Samples	Cost per Sample (WTU or $)	Total Expenditure (WTU or $)
TSS only	28	12	336
TDS/TSS	0	24	0
Chloride, Sulfate & Bromide	0	36	0
Nutrients	32	76	2432
Nutrients, low phosphorus	0	100	0
Total Metals	24	90	2160
Dissolved Metals + Ca, Mg	28	210	5880
E. coli (in-house)	32	$5.08	$163
Volatile Organic Compunds	14	150	2100
Semi-volatile Organics	10	180	1800
Radionuclides	10	120	1200
Cyanide, total	0	40	0
Chlorophyll *a* (in-house)	24	$45	$1,074
Periphyton*	0	$425	$0
Phytoplankton	25	$165	$4,125
Macroinvertebrates	0	$175	$0
TOTALS		**WTU**	**15,908**
		DOLLAR $	**$5,362**

*Periphyton samples are only collected at sites that do not pass the level one nutrient assessment. Where parameters indicate possible nutrient enrichment, a more intensive survey is done which includes the collection of periphyton. The number of periphyton samples to be collected will be unknown until after 3 to 5 sampling runs.

Table 9a **Survey Vehicle Cost (Streams)**

Month	Approximate Miles	Estimated MPG	Estimated Cost of Gasoline per Gallon	Total Fuel Costs
March	900	17	$3.50	$185.29
April	900	17	$3.50	$185.29
May	900	17	$3.50	$185.29
June	900	17	$3.50	$185.29
July	900	17	$3.50	$185.29
August	900	17	$3.50	$185.29
September	900	17	$3.50	$185.29
October	900	17	$3.50	$185.29
TOTAL				**$1,482.35**

Table 9b **Survey Vehicle Cost (Lakes)**

Month	Approximate Miles	Estimated MPG	Estimated Cost of Gasoline per Gallon	Total Fuel Costs
March	1000	17	$3.50	$205.88
April		17	$3.50	$0.00
May	1000	17	$3.50	$205.88
June		17	$3.50	$0.00
July	1000	17	$3.50	$205.88
August		17	$3.50	$0.00
September	1000	17	$3.50	$205.88
October		17	$3.50	$0.00
TOTAL				**$823.53**

Table 10a **Stream Survey Per Diem Costs**

Expense	Water Chemistry Surveys	Biological and Habitat Surveys	Total
Per Diem (number of nights out)	$2,720	$3,060	$5,780
Salary Days	48	48	96

*Staff days are estimated for 1 crew of 2 going out for chemistry surveys for three days and 1 crew of 4 going out for four day bio/habitat surveys.

Table 10b **Lake Survey Per Diem Costs**

Expense	Water Chemistry Surveys	Biological and Habitat Surveys	Total
Per Diem (number of nights out)	$2,040	$0	$2,040
Salary Days	40	0	40

*Staff days are estimated for southern chemistry runs as 2 staff going out for three days; northern chemistry runs will be two days.

Table 11 **Total Cost Estimates**

Survey	**WTUs**	**Bio Sample $**	**Fuel $**	**Per Diem $**	**Staff Field Days**
Stream	65576	8956	1482	5780	96
Lake	15908	5362	824	2040	40
TOTAL	**81484**	**14318**	**2306**	**7820**	**136**

*Per Diem estimates do not include partial day rates

6.0 REFERENCES

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APPENDIX A

IR (Integrated Report) Category Overall water quality standards attainment category for each assessment unit as determined by combining individual designated use support decisions. The unique assessment categories for New Mexico are described as follows as follows:

IR Category 1	Attaining the water quality standards for all designated and existing uses. AUs are listed in this category if there are data and information that meet all requirements of the assessment and listing methodology and support a determination that the water quality criteria are attained.
IR Category 2	Attaining some of the designated or existing uses based on numeric and narrative parameters that were tested, and no reliable monitored data is available to determine if the remaining uses are attained or threatened. AUs are listed in this category if there are data and information that meet requirements of the assessment and listing methodology to support a determination that some, but not all, uses are attained based on numeric and narrative water quality criteria that were tested. Attainment status of the remaining uses is unknown because there is no reliable monitored data with which to make a determination.
IR Category 3	No reliable monitored data and/or information to determine if any designated or existing use is attained. AUs are listed in this category where data to support an attainment determination for any use are not available, consistent with requirements of the assessment and listing methodology.
IR Category 4A	Impaired for one or more designated uses, but does not require development of a TMDL because TMDL has been completed. AUs are listed in this subcategory once all TMDL(s) have been developed and approved by USEPA that, when implemented, are expected to result in full attainment of the standard. Where more than one pollutant is associated with the impairment of an AU, the AU remains in Category 5A (see below) until all TMDLs for each pollutant have been completed and approved by USEPA.
IR Category 4B	Impaired for one or more designated uses, but does not require development of a TMDL because other pollution control requirements are reasonably expected to result in attainment of the water quality standard in the near future. Consistent with the regulation under 40 CFR 130.7(b)(i),(ii), and (iii), AUs are listed in this subcategory where other pollution control requirements required by local, state, or federal authority are stringent enough to implement any water quality standard (WQS) applicable to such waters.
IR Category 4C	Impaired for one or more designated uses, but does not require development of a TMDL because impairment is not caused by a pollutant. AUs are listed in this subcategory if a pollutant does not cause the impairment. For example, USEPA considers flow alteration to be “pollution” vs. a “pollutant.”
IR Category 5/5A	Impaired for one or more designated or existing uses and a TMDL is underway or scheduled. AUs are listed in this category if the AU is impaired for one or more designated uses by a pollutant. Where more than one pollutant is associated with the impairment of a single AU, the

	AU remains in Category 5A until TMDLs for all pollutants have been completed and approved by USEPA.
IR Category 5/5B	Impaired for one or more designated or existing uses and a review of the water quality standard will be conducted. AUs are listed in this category when it is possible that water quality standards are not being met because one or more current designated use is inappropriate. After a review of the water quality standard is conducted, a Use Attainability Analysis (UAA) will be developed and submitted to USEPA for consideration, or the AU will be moved to Category 5A and a TMDL will be scheduled.
IR Category5/5C	Impaired for one or more designated or existing uses and Additional data will be collected before a TMDL is scheduled. AUs are listed in this category if there is not enough data to determine the pollutant of concern or there is not adequate data to develop a TMDL. For example, AUs with biological impairment will be listed in this category until further research can determine the particular pollutant(s) of concern. When the pollutant(s) are determined, the AU will be moved to Category 5A and a TMDL will be scheduled. If it is determined that the current designated uses are inappropriate, it will be moved to Category 5B and a UAA will be developed. If it is determined that “pollution” is causing the impairment (vs. a “pollutant”), the AU will be moved to Category 4C.

APPENDIX B

Organics (semi-volatiles)	Organics (volatiles)
1,2,4-Trichlorobenzene	1,1,1,2-Tetrachloroethane
1,2-Dichlorobenzene	1,1,1-Trichloroethane
1,2-Dinitrobenzene	1,1,2,2-Tetrachloroethane
1,3-Dichlorobenzene	1,1,2-Trichloroethane
1,3-Dinitrobenzene	1,1-Dichloroethane
1,4-Dichlorobenzene	1,1-Dichloroethene
1,4-Dinitrobenzene	1,1-Dichloropropene
1-Methylnaphthalene	1,2,3-Trichlorobenzene
2,3,4,6-Tetrachlorophenol	1,2,3-Trichloropropane
2,3,5,6-Tetrachlorophenol	1,2,4-Trichlorobenzene
2,4,5-Trichlorophenol	1,2,4-Trimethylbenzene
2,4,6-Trichlorophenol	1,2-Dibromo-3-chloropropane (DBCP)
2,4-Dichlorophenol	1,2-Dibromoethane (EDB)
2,4-Dimethylphenol	1,2-Dichlorobenzene
2,4-Dinitrophenol	1,2-Dichloroethane
2,4-Dinitrotoluene	1,2-Dichloropropane
2,6-Dinitrotoluene	1,3,5-Trimethylbenzene
2-Chloronaphthalene	1,3-Dichlorobenzene
2-Chlorophenol	1,3-Dichloropropane
2-Methylnaphthalene	1,4-Dichlorobenzene
2-Methylphenol	1,4-Dioxane
2-Nitroaniline	2,2-Dichloropropane
2-Nitrophenol	2-Butanone (MEK)
3,3'-Dichlorobenzidine	2-Chloroethyl vinyl ether
3-Methylphenol & 4-Methylphenol	2-Chlorotoluene
3-Nitroaniline	2-Hexanone
4,4'-DDD	4-Chlorotoluene
4,4'-DDE	4-Isopropyltoluene
4,4'-DDT	4-Methyl-2-pentanone
4,6-Dinitro-2-methylphenol	Acetone
4-Bromophenyl Phenyl Ether	Acetonitrile
4-Chloro-3-methylphenol	Acrolein
4-Chloroaniline	Acrylonitrile
4-Chlorophenyl Phenyl Ether	Allyl chloride
4-Nitroaniline	Benzene
4-Nitrophenol	Bromobenzene
Acenaphthene	Bromochloromethane
Acenaphthylene	Bromodichloromethane
Alachlor	Bromoform
Aldrin	Bromomethane
alpha-BHC	Carbon disulfide
Aniline	Carbon tetrachloride
Anthracene	Chlorobenzene
Atrazine	Chloroethane
Azobenzene	Chloroform

Organics (semi-volatiles)	Organics (volatiles)
Benzidine	Chloromethane
Benzo(a)anthracene	Chloroprene
Benzo(a)pyrene	cis-1,2-Dichloroethene
Benzo(b)fluoranthene	cis-1,3-Dichloropropene
Benzo(g,h,i)perylene	cis-1,4-Dichloro-2-butene
Benzo(k)fluoranthene	Dibromochloromethane
Benzyl alcohol	Dibromomethane
beta-BHC	Dichlorodifluoromethane
bis(2-Chloroethoxy)methane	Ethyl methacrylate
bis(2-Chloroethyl)ether	Ethylbenzene
bis(2-Chloroisopropyl)ether	Hexachlorobutadiene
bis(2-Ethylhexyl)adipate	Iodomethane
bis(2-Ethylhexyl)phthalate	Isobutyl alcohol
Butyl Benzyl Phthalate	Isopropylbenzene
Carbazole	m- & p-Xylenes
Chrysene	Methyl methacrylate
cis-Chlordane	Methylacrylonitrile
Cyanazine	Methylene chloride (Dichloromethane)
delta-BHC	Naphthalene
Dibenz(a,h)anthracene	n-Butylbenzene
Dibenzofuran	Nitrobenzene
Dieldrin	o-Xylene
Diethylphthalate	Pentachloroethane
Dimethylphthalate	Propionitrile
Di-n-butyl Phthalate	Propylbenzene
Di-n-octyl phthalate	sec-Butylbenzene
Endosulfan I	Styrene
Endosulfan II	tert-Butyl methyl ether (MTBE)
Endosulfan sulfate	tert-Butylbenzene
Endrin	Tetrachloroethene
Endrin aldehyde	Tetrahydrofuran (THF)
Endrin ketone	Toluene
Fluoranthene	Total trihalomethanes
Fluorene	Total xylenes
gamma-BHC (lindane)	trans-1,2-Dichloroethene
Heptachlor	trans-1,3-Dichloropropene
Heptachlor epoxide	trans-1,4-Dichloro-2-butene
Hexachlorobenzene	Trichloroethene
Hexachlorobutadiene	Trichlorofluoromethane
Hexachlorocyclopentadiene	Vinyl acetate
Hexachloroethane	Vinyl chloride
Indeno(1,2,3-cd)pyrene	
Isophorone	
Methoxychlor	
Metolachlor	
Metribuzin	
Naphthalene	

Organics (semi-volatiles)	Organics (volatiles)
Nitrobenzene	
N-nitrosodimethylamine	
N-nitroso-di-n-propylamine	
N-nitrosodiphenylamine	
Pentachlorophenol	
Phenanthrene	
Phenol	
Prometryne	
Pyrene	
Pyridine	
Simazine	
trans-Chlordane	